

# RESERVE COPY PATENT SPECIFICATION



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## COMPLETE SPECIFICATION

### Method of Producing Therapeutically and Disinfectantly Active Substances

We, SYNGALA FABRIK FÜR CHEMISCH-SYNTHETISCHE UND GALENISCHE ARZNEI-MITTEL GESELLSCHAFT M.B.H., a limited Liability Company incorporated under the laws of Austria of 23, Seeböckgasse, Vienna XVI., and Dr. FRITZ FEIGL, an Austrian Citizen of 38, Währingerstrasse, Vienna XVIII, Austria, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the production of substances of active therapeutic and disinfectant properties. It has already been proposed, for sterilising and/or disinfecting purposes, to employ metals or metallic compounds, or mixtures thereof, also with the use of carrier substances, thereby as a rule utilising the oligodynamic effect observable in connection with metals.

The present invention provides a method of producing substances of active therapeutic, disinfectant, and/or sterilising properties, and containing gold in an active form conjointly with oligodynamically acting silver together with substances of an oxidising action, the products of this method invariably containing the effective constituents in a perfectly homogeneous and extremely finely divided state. The invention further covers a method of uniformly impregnating a large variety of carrier substances with a mixture of highly active gold and silver in a very simple and economical manner.

It is already known to mix gold salt solutions with solutions of metal salts such as manganese, nickel, cobalt and iron salts, with the addition of an alkali to promote reaction and to obtain precipitation.

It has already been proposed to produce therapeutic or disinfectant substances by causing a compound producing silver ions to react with a compound of a metal which is capable of existing in a plurality of valencies, and which is present in a lower valency, in an alkaline

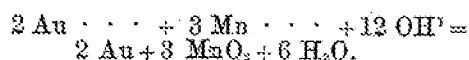
medium. In contrast to these known products the substances produced by the present process have an increased activity so that the content of active metals can be reduced whilst the activity remains the same.

According to the present invention a method of producing gold and silver containing substances of active therapeutic, disinfectant and/or sterilising properties, is characterised in that compounds yielding silver ions and gold ions are caused to react conjointly, in an aqueous or other suitable liquid medium, in the presence of alkaline substances with compounds of metals which are capable of existing in a plurality of valencies, a compound of a metal in a lower valency, present as cation being employed.

The hydroxyl ions can be supplied by the addition of any substance of alkaline reaction, for example alkalis, alkali carbonates, and organic bases, as also by the employment of oxides, hydroxides and alkaline salts of the very metallic compounds used for the conversion reaction. Examples of suitable metallic compounds are manganous, cobaltous, nickelous, ferrous, and cerous salts on the one hand, and gold salts such as gold chloride, chlorauric acid, and the like on the other hand. For this purpose there may also be employed for example the silver salt of chlorauric acid as compound yielding both silver and gold ions.

When these substances are reacted in an alkaline medium there result bulky but readily filterable and easily washable precipitates consisting of extremely finely divided gold, silver, and the higher valency oxides or hydroxides of the multivalent metals used.

The conversion reaction proceeds, for example, according to the following equation:—



The described conversions should take place in the absence of compounds capable of forming soluble complex salts

with the said metallic compounds capable of existing in a plurality of valencies.

Very special advantages are afforded by a form of the method according to the invention which consists in directly depositing the effective substances according to the invention on to various kinds of carrier material in the course of the formation of these substances. For this purpose the impregnating of the carriers, for example surgical dressing material, is preferably carried out in such a manner that the carriers are brought in contact with compounds yielding gold ions and also silver ions, and with a compound of a metal which is capable of existing in a plurality of valencies, and which is present in a lower valency as cation, and either previously or thereafter treated with substances of alkaline reaction or solutions thereof.

As carriers there may serve, for instance for the production of antiseptic and even permanently sterile surgical dressing material, fibrous matter of all kinds, such as textile fibres, cotton, and fabrics; further, there can also be employed as carrier material substances such as animal charcoal, silica gels, bole, and other pulverulent substances which are innocuous for the purpose in view and which can also themselves serve as suppliers of hydroxyl ions. This can be effected either by pre-treating the carrier with substances of alkaline reaction or by using such substances as are themselves of sufficiently alkaline reaction such as alkaline earth carbonates, oxides such as  $MgO$ ,  $ZnO$ , and others. In all these cases it is sufficient to treat the carriers with a solution of the starting materials and subsequently to wash out any excess of these substances. It is also of course possible to employ as carriers substances (such as animal charcoal) which themselves have therapeutical properties.

In many cases it is advantageous to carry out the reaction in the presence of protective colloids, for example albuminous bodies, vegetable mucilages, lecithins, and the like. In this manner colloidal solutions or extremely fine suspensions of the reaction products can be produced, which have proved to be effective for example as activators or for the treatment of various infectious diseases such as for instance gonorrhoea.

In applying the method according to the invention for the impregnating of carrier substances the quantity of the resulting reaction products, i.e. gold silver, and higher valency metal oxides, can be accurately pre-determined, in a

simple manner, merely by suitable proportioning of the hydroxyl ion supplier used. The proportions of the individual components, and the order in which they are used, can, however, be varied to suit the purpose for which the product is to be used.

#### EXAMPLES

(1) To a solution of 34 grammes of silver nitrate and 37.5 grammes of manganese nitrate hydrate in a litre of water there is added a solution of 8.25 grammes of chlorauric acid in 100 ccs of water. A yellowish precipitate is at once formed, consisting of the silver salt of chlorauric acid. An excess of caustic soda solution is then added, after which the mixture is left to stand for some time while being agitated. The precipitate is then filtered off under suction, washed with water, and dried.

(2) 200 grammes of gauze is dipped in a solution of 0.42 gramme of chlorauric acid and 0.43 gramme of manganese nitrate hydrate in a litre of water. The gauze, after being squeezed out, is then immersed in a solution of 3.4 grammes of silver nitrate and 2.9 grammes of manganese nitrate hydrate in a litre of water expressed, and introduced into two litres of a 2% caustic soda solution. The gauze is then freed from the surplus alkali by washing with water, and dried.

(3) 50 grammes of gelatine is dissolved in 2.5 litres of water, boiled for several minutes, and after cooling off admixed with a solution of 34 grammes of silver nitrate and 37.5 grammes of manganese nitrate. There is then carefully added, with stirring, a solution of 8.25 grammes of chlorauric acid in 500 ccs of water. The silver salt of chlorauric acid formed remains in a colloidal state in solution. A 2% caustic soda solution is then added, under constant stirring, until the solution is of definitely alkaline reaction. For the purpose of removing admixtures of electrolyte the solution is then placed in parchment containers and dialyzed with water for several days. An intensely black liquid of almost neutral reaction is obtained in this manner.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of producing gold and silver containing substances of active therapeutic, disinfectant, and/or sterilising properties, characterised by the fact that compounds yielding silver ions and gold ions are caused to react conjointly, in an aqueous or other suitable liquid medium in the present of alkaline sub-

stances with compounds of metals which are capable of existing in a plurality of valencies, a compound of a metal in a lower valency, present as a cation, being  
5 employed.

2. A method according to Claim 1, characterised by bringing carrier substances into contact with compounds yielding gold ions and silver ions and the  
10 other metal compound and incorporating therewith, either before or after this treatment, substances of alkaline reaction or solutions thereof.

3. A method according to claim 2, characterised by the employment as the said carrier substances of substances which are themselves of sufficiently alkaline reaction, such as for example metal oxides, carbonates, and the like, or  
20 by the impregnation of inert carriers with substances of alkaline reaction.

4. A method according to any of the preceding claims, characterised by the fact that the conversion is caused to proceed in the presence of protective colloids  
25 (such as for example albuminous bodies, vegetable mucilage, and the like).

5. The method of producing gold and silver containing substances of active therapeutic, disinfectant, and/or sterilising properties, substantially as described with reference to the Example  
30 given.

6. Gold and silver containing substances of active therapeutic, disinfectant, and/or sterilising properties, whenever produced by the method according to any of the preceding claims.  
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Dated this 30th day of April, 1933.

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